Claims

1. A music playback method for playing back music audio data by using a music audio data playback apparatus for playing back the music audio data, comprising:

a first step of preparing in advance a plurality of characteristic music structure section specifying data for specifying characteristic music structure sections in a piece of music in respect of the music audio data to be played back;

a second step of providing an interface for selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections; and

a third step of changing a playback position of the music audio data to be played back by the music audio data playback apparatus to the arbitrary characteristic music structure section, based on the characteristic music structure section specifying data corresponding to the arbitrary characteristic music structure section that an operator has selected by using the interface after starting playback of the music audio data by using the music audio data playback apparatus.

2. A music playback method for playing back an arbitrary characteristic music structure section selected from a plurality of characteristic music structure sections in a

piece of music by using a music audio data playback apparatus for playing back music audio data, comprising:

a first step of preparing in advance a plurality of characteristic music structure section specifying data for specifying the plurality of characteristic music structure sections in respect of the music audio data to be played back;

a second step of providing an interface for selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections; and

a third step of causing the music audio data playback apparatus to play back the arbitrary characteristic music structure section, based on the characteristic music structure section specifying data corresponding to the arbitrary characteristic music structure section which an operator has selected by using the interface.

3. The music playback method according to claim 1 or 2, wherein the characteristic music structure section is a chorus section in the piece of music.

4. The music playback method according to claim 1 or 2, wherein the characteristic music structure section includes repeated sections in the piece of music.

5. The music playback method according to claim 1 or 2,

wherein at the first step, the plurality of characteristic music structure sections are manually identified based on the music audio data, and the plurality of characteristic music structure section specifying data for specifying the plurality of characteristic music structure sections which have been identified are created.

6. The music playback method according to claim 1 or 2, wherein at the first step, the plurality of characteristic music structure sections are identified based on statistical data on playback behaviors of a plurality of trial listeners who have played back the music audio data to be played back, and the plurality of characteristic music structure section specifying data for specifying the plurality of characteristic music structure sections which have been identified are created.

7. The music playback method according to claim 1 or 2, wherein the interface provided at the second step has a graphic display portion for graphically displaying a length of the music audio data along a time axis, and also graphically displaying, along the time axis, a playback position of the music audio data which is being played back by the music audio data playback apparatus and the plurality of characteristic music structure sections.

8. The music playback method according to claim 7, wherein

the plurality of characteristic music structure sections include a plurality of chorus sections indicative of chorus parts of a piece of music, and a plurality of repeated sections indicative of repeated parts of the music, and the plurality of chorus sections and the plurality of repeated sections are distinctively displayed on the graphic display portion.

9. The music playback method according to claim 1 or 2, wherein the interface has one or more selection buttons to be manipulated by an operator for selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections.

10. The music playback method according to claim 9, wherein the one ore more selection buttons include one or more chorus section selection buttons for selecting only the chorus sections from the plurality of characteristic music structure sections.

11. The music playback method according to claim 10, wherein the one or more chorus section selection buttons include a first chorus section selection button for selecting a previous chorus section, and a second chorus section selection button for selecting a next chorus section.

12. The music playback method according to claim 9, wherein

the one or more selection buttons include a first repeated section selection button for selecting a previous repeated section when selecting the plurality of repeated sections and a second repeated section selection button for selecting a next repeated section when selecting the plurality of repeated sections.

13. The music playback method according to claim 1 or 2, wherein the interface provided at the second step has a graphic display portion for graphically displaying a length of the music audio data using a time axis, and also graphically displaying a playback position of the music audio data which is being played back by the music audio data playback apparatus and the plurality of characteristic music structure sections, using the time axis;

the interface has one or more selection buttons to be manipulated by an operator for selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections; and

the one or more selection buttons are graphic display buttons shown on the graphic display portion.

14. The music playback method according to claim 13, wherein the plurality of characteristic music structure sections include a plurality of chorus sections indicative of chorus parts of a piece of music, and a plurality of repeated sections indicative of repeated parts of the music;

the plurality of chorus sections and the plurality of repeated sections are distinctively displayed on the graphic display portion; and

the plurality of chorus sections and the plurality of repeated sections displayed on the graphic display portion are represented as one or more selection buttons to be manipulated by an operator for selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections.

15. A music playback system, which has a music audio data playback apparatus for playing back music audio data and a function of playing back an arbitrary characteristic music structure section selected from a plurality of characteristic music structure sections in a piece of music, comprising:

an interface having a function of selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections;

a characteristic music structure section specifying data storage means for storing characteristic music structure section specifying data for specifying the plurality of characteristic music structure sections that have been predetermined corresponding to the music audio data to be played back; and

a specifying data providing means for providing the music audio data playback apparatus with the characteristic

music structure section specifying data for specifying the arbitrary characteristic music structure section selected by the interface,

wherein the music audio data playback apparatus is so constructed as to change a playback position to the characteristic music structure section specified by the characteristic music structure section specifying data which has been provided by the specifying data providing means.

16. The music playback system according to claim 15, wherein the music audio data is accompanied by the characteristic music structure section specifying data, and the characteristic music structure section specifying data storage means reads and stores the characteristic music structure section specifying data accompanying the music audio data.

17. The music playback system according to claim 15 further comprising a characteristic section specifying data generation means for automatically extracting from the music audio data the plurality of characteristic music structure sections in the music and generating the characteristic music structure section specifying data.

18. The music playback system according to claim 15, wherein the characteristic music structure section is a chorus

section in the music.

19. The music playback system according to claim 18, wherein the characteristic music structure sections include a repeated sections in the music.

20. The music playback system according to claim 15, wherein the interface has a graphic display portion for graphically displaying a length of the music audio data along a time axis, and also graphically displaying, along the time axis, a playback position of the music audio data which is being played back by the music audio data playback apparatus and the plurality of characteristic music structure sections.

21. The music playback system according to claim 20, wherein the plurality of characteristic music structure sections include a plurality of chorus sections indicative of chorus parts of a piece of music, and a plurality of repeated sections indicative of repeated parts of the music; and the graphic display portion has a function of distinctively displaying the plurality of chorus sections and the plurality of repeated sections.

22. The music playback system according to claim 20, wherein the interface has one or more selection buttons to be manipulated by an operator for selecting an arbitrary characteristic music structure section from the plurality

of characteristic music structure sections.

23. The music playback system according to claim 22, wherein the one or more selection buttons include one or more chorus section selection buttons for selecting only the chorus sections from the plurality of characteristic music structure sections.

24. The music playback system according to claim 22, wherein the one or more chorus section selection buttons include a first chorus section selection button for selecting a previous chorus section and a second chorus section selection button for selecting a next chorus section.

25. The music playback system according to claim 22, wherein the one or more selection buttons include a first repeated section selection button for selecting a previous repeated section when selecting the plurality of repeated sections and a second repeated section selection button for selecting a next repeated section when selecting the plurality of repeated sections.

26. The music playback system according to claim 22, wherein the one or more selection buttons are graphic display buttons shown on the graphic display portion.

27. The music playback system according to claim 26, wherein

the plurality of characteristic music structure sections include a plurality of chorus sections indicative of chorus parts of a piece of music and a plurality of repeated sections indicative of repeated parts of the music;

the plurality of chorus sections and the plurality of repeated sections are distinctively displayed on the graphic display portion; and

the graphic display portion is so constructed as to represent the plurality of chorus sections and the plurality of repeated sections displayed on the graphic display portion as the one or more selection buttons to be manipulated by an operator for selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections.

28. An interface, used for selecting an arbitrary characteristic music structure section and transmitting a selection result when playing back the arbitrary characteristic music structure section selected from a plurality of characteristic music structure sections in a piece of music using a music audio data playback apparatus for playing back music audio data, comprising one or more selection buttons including a chorus section selection button to be manipulated by an operator for selecting the chorus section included in the plurality of characteristic music structure sections.

29. The interface according to claim 28, wherein the one or more selection buttons include a first chorus section selection button for selecting a previous chorus section and a second chorus section selection button for selecting a next chorus section.

30. The interface according to claim 28 further comprising a first repeated section selection button for selecting a previous repeated section when selecting a plurality of repeated sections included in the plurality of characteristic music structure sections and a second repeated section selection button for selecting a next repeated section when selecting a plurality of repeated sections included in the plurality of characteristic music structure sections.

31. The interface according to claim 28 further comprising a graphic display portion for graphically displaying a length of the music audio data along a time axis, and also graphically displaying, along the time axis, a playback position of the music audio data which is being played back by the music audio data playback apparatus and the plurality of characteristic music structure sections.

32. The interface according to claim 31, wherein the plurality of characteristic music structure sections include a plurality of chorus sections indicative of chorus

parts of a piece of music and a plurality of repeated sections indicative of repeated sections of the music;

the plurality of chorus sections and the plurality of repeated sections are distinctively displayed on the graphic display portion; and

the plurality of chorus sections and the plurality of repeated sections displayed on the graphic display portion are represented as the one or more selection buttons to be manipulated by an operator for selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections.

33. A program for implementing a music playback system, intended for causing a computer to perform a function of playing back an arbitrary characteristic music structure section selected from a plurality of characteristic music structure sections in a piece of music by using a system including the computer, a display to be operated based on a command from the computer, and a music audio data playback apparatus for playing back music audio data according to a command from the computer,

the program being so constructed as to cause the computer to perform:

a function of constructing on the display an interface for selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections;

a function of constructing a characteristic music structure section specifying data storage means for storing characteristic music structure section specifying data for specifying the plurality of characteristic music structure sections which have been predetermined corresponding to the music audio data to be played back;

a function of constructing a specifying data providing means for providing the music audio playback apparatus with the characteristic music structure section specifying data for specifying the arbitrary characteristic music structure section selected by the interface; and

a function of giving the music audio data playback apparatus a command to play back the characteristic music structure section specified by the characteristic music structure section specifying data which has been provided by the specifying data providing means.

34. The program for implementing a music playback system according to claim 33, wherein the function of constructing the interface on the display is capable of forming on the display one or more selection buttons including a chorus section selection button to be manipulated by an operator for selecting a chorus section included in the plurality of characteristic music structure sections.

35. The program for implementing a music playback system

according to claim 33, wherein the function of constructing the interface on the display is further capable of graphically displaying a length of the music audio data along a time axis on the display and is also capable of graphically displaying along the time axis a playback position of the music audio data which is being played back by the music audio data playback apparatus and the plurality of characteristic music structure sections.

36. The program for implementing a playback system according to claim 33, wherein the plurality of characteristic music structure sections include a plurality of chorus sections indicative of chorus parts of a piece of music and a plurality of repeated sections indicative of repeated parts of the music; and

the function of constructing the interface on the display is further capable of distinctively displaying the plurality of chorus sections and the plurality of repeated sections, and representing the plurality of chorus sections and the plurality of repeated sections displayed on the display as the one or more selection buttons to be manipulated by an operator for selecting an arbitrary characteristic music structure section from the plurality of characteristic music structure sections.

37. A characteristic music structure section extraction method for extracting characteristic music structure

sections from music audio data, wherein the characteristic music structure sections are extracted based on statistical data on playback behaviors of trial listeners who have played back the music audio data to be played back.

38. The characteristic music structure section extraction method according to claim 37, wherein sections, which are played back by a plurality of trial listeners many times, are defined as the characteristic music structure sections.

39. The characteristic music structure section extraction method according to claim 38, wherein data on the sections which are played back by the plurality of trial listeners many times are collected from a plurality of music playback systems for trial listening connected to a network.

40. The characteristic music structure section extraction method according to claim 39, wherein the data are made visually recognizable as a histogram, and the plurality of characteristic music structure sections are identified from the histogram.

41. A chorus section detection method for detecting a chorus section in music audio data, which detects a part corresponding to a chorus section in music audio data of a piece of music in order to detect repeated chorus sections in the music, comprising:

an acoustic feature extraction step of sequentially extracting acoustic features from the music audio data every predetermined time unit;

a similarity calculation step of calculating similarities between the acoustic features extracted from the music audio data;

a repeated section listing step of listing up a plurality of repeated sections repeatedly appearing in the music audio data, based on the similarities;

an integrated repeated section determination step of examining an interrelationship among the plurality of repeated sections listed up, integrating one or more of the repeated sections, which fall within a common section on a time axis, into one integrated repeated section on the time axis, grouping a plurality of the integrated repeated sections thus obtained for each of the common sections into a plurality of types of integrated repeated section rows; and

a chorus section determination step of determining the repeated chorus sections from the plurality of types of integrated repeated section rows.

42. The chorus section detection method for detecting a chorus section in music audio data according to claim 41, wherein each of the acoustic features extracted at the acoustic feature extraction step is 12-dimensional chroma vectors obtained by respectively adding, over a plurality

of octaves, a power at frequency of each of 12 pitch classes included in a range of one octave.

43. The chorus section detection method for detecting a chorus section in music audio data according to claim 42, wherein the similarity calculation step calculates the similarities between acoustic features newly extracted and all of the acoustic features previously extracted.

44. The chorus section detection method for detecting a chorus section in music audio data according to claim 43, wherein the similarity calculation step calculates the similarities between the 12-dimensional chroma vectors at time t and all of the 12-dimensional chroma vectors during a period from time t to time l lag earlier ($0 \leq l \leq t$);

the repeated section listing step assumes one axis as a time axis and another axis as a lag axis, and lists up as the repeated section relative to the time axis a similarity line segment having a time length which corresponds to a length of a part where the similarity exceeds a predetermined threshold, when the similarity exceeds the predetermined threshold during a period of time longer than a predetermined time length.

45. The chorus section detection method for detecting a chorus section in music audio data according to claim 44, wherein the integrated repeated section determination step

integrates the similarity line segments falling within the common section on the time axis into the integrated repeated section for each of the common sections, and groups a plurality of the integrated repeated sections into the plurality of types of the integrated repeated section rows, based on positions and lengths of the common sections on the time axis, and positional relationships relative to the lag axis among the similarity line segments to be grouped.

46. The chorus section detection method for detecting a chorus section in music audio data according to claim 45, wherein the integrated repeated section determination step creates the integrated repeated section row by complementing a first repeated section not included in the integrated repeated sections.

47. The chorus section detection method for detecting a chorus section in music audio data according to claim 41, wherein the music involves modulation;

the acoustic feature extraction step obtains 12 types of the acoustic features having different modulation widths by shifting the acoustic features comprising the 12-dimensional chroma vectors, by one modulation width, 11 times;

the similarity calculation step calculates the similarities between the acoustic features newly extracted and all of the acoustic features of the 12 types previously

obtained to define the similarities between the 12-dimensional chroma vectors indicative of the acoustic features newly extracted at time t and the 12-dimensional chroma vectors indicative of all of the acoustic features of the 12 types that have been obtained during a period from time t to time l lag earlier ($0 \leq l \leq t$);

the repeated section listing step assumes one axis as a time axis t and another axis as a lag axis l, and lists up the similarity line segments as the repeated sections relative to the time axis respectively for the 12 types of the acoustic features,

each of the similarity line segments having a time length corresponding to a length of a part where the similarity exceeds a predetermined threshold during a period of time longer than a predetermined time length.

48. The chorus section detection method for detecting a chorus section in music audio data according to claim 47, wherein the integrated repeated section determination step integrates the similarity line segments falling within the common section on the time axis into an integrated repeated section for each of the 12 types of the acoustic features and groups a plurality of the integrated repeated sections determined for the 12 types of the acoustic features into the plurality of types of integrated repeated section rows with consideration given to the plurality of types of modulations, based on positions and lengths of the common

sections on the time axis, and positional relationships relative to the lag axis among the similarity line segments to be grouped.

49. The chorus section detection method for detecting a chorus section in music audio data according to claim 41, wherein the chorus section determination step evaluates chorus possibility for each of the integrated repeated sections included in each of the integrated repeated rows, based on a mean of the similarities of the integrated repeated sections included in each of the integrated repeated section rows and the number and length of the integrated repeated sections included in each of the integrated repeated section rows, and defines the integrated repeated sections, included in the integrated repeated section row, having the highest chorus possibility as the chorus sections.

50. A chorus section detection apparatus for detecting a chorus section in music audio data, which detects a part corresponding to a chorus section in music audio data of a piece of music and displays the part on a display means in order to detect repeated chorus sections in the music, comprising:

an acoustic feature extraction means for sequentially extracting acoustic features from the music audio data every predetermined time unit;

a similarity calculation means for calculating similarities between the acoustic features extracted from the music audio data;

a repeated section listing means for listing up a plurality of repeated sections repeatedly appearing in the music audio data, based on the similarities;

an integrated repeated section determination means for examining an interrelationship among the plurality of repeated sections listed up, integrating one or more of the repeated sections, which fall within a common section on a time axis, into one integrated repeated section, and grouping a plurality of the integrated repeated sections thus obtained into a plurality of types of integrated repeated section rows; and

a chorus section determination means for determining the chorus sections from the plurality of types of integrated repeated section rows,

wherein the plurality of types of integrated repeated section rows are displayed on the display means, and the integrated repeated section row including the chorus sections displayed in a different manner from the other integrated repeated section rows.

51. A chorus section detection apparatus for detecting a chorus section in music audio data, which detects a part corresponding to a chorus section in music audio data of a piece of music and displays the part on a display means

in order to detect repeated chorus sections to be repeated in the music, comprising;

an acoustic feature extraction means for sequentially extracting acoustic features from the music audio data every predetermined time unit;

a similarity calculation means for calculating similarities between the acoustic features extracted from the music audio data;

a repeated section listing means for listing up a plurality of repeated sections repeatedly appearing in the music audio data, based on the similarities;

an integrated repeated section determination means for examining an interrelationship among the plurality of repeated sections listed up, integrating one or more of the repeated sections, which fall within a common section on a time axis, into one integrated repeated section, and grouping a plurality of the integrated repeated sections thus obtained into a plurality of types of integrated repeated section rows; and

a chorus section determination means for determining the repeated chorus sections from the plurality of types of integrated repeated section rows.

52. The chorus section detection apparatus for detecting a chorus section in music audio data according to claim 51, wherein the integrated repeated section determination means is so constructed as to create the integrated repeated

section row by complementing a first repeated section not included in the integrated repeated sections.

53. A playback chorus section detection apparatus for detecting a chorus section in music audio data, which detects a part corresponding to a chorus section in music audio data of a piece of music and play back the chorus section by means of a playback means, comprising:

an acoustic feature extraction means for sequentially extracting acoustic features from the music audio data every predetermined time unit;

a similarity calculation means for calculating similarities between the acoustic features extracted from the music audio data;

a repeated section listing means for listing up a plurality of repeated sections repeatedly appearing in the music audio data, based on the similarities;

an integrated repeated section determination means for examining an interrelationship among the plurality of repeated sections listed up, integrating one or more of the repeated sections, which fall within a common section on a time axis, into one integrated repeated section, and grouping a plurality of the integrated repeated sections thus obtained into a plurality of types of integrated repeated section rows; and

a chorus section determination means for determining the chorus sections from the plurality of types of

integrated repeated section rows,

wherein the plurality of types of integrated repeated section rows are selectively played back by the playback means.

54. A program for a music playback system, intended for causing a computer to implement a method of detecting a part corresponding to a chorus section in music audio data of a piece of music in order to detect the repeated chorus sections in the music,

the program being so constructed as to cause the computer to perform:

an acoustic feature extraction step of sequentially extracting acoustic features from the music audio data every predetermined time unit;

a similarity calculation step of calculating similarities between the acoustic features extracted from the music audio data;

a repeated section listing step of listing up a plurality of repeated sections repeatedly appearing in the music audio data, based on the similarity;

an integrated repeated section determination step of examining an interrelationship among the plurality of repeated sections listed up, integrating one or more of the repeated sections, which fall within a common section on a time axis, into one integrated repeated section, and grouping a plurality of the integrated repeated sections

thus obtained into a plurality of types of integrated repeated section rows; and

a chorus section determination step of determining the repeated chorus sections from the plurality of types of integrated repeated section rows.

55. The program for a music playback system according to claim 54, wherein the integrated repeated section determination step creates the integrated repeated section row by complementing a first repeated section not included in the integrated repeated sections.